MULTI-PURPOSE STRUCTURAL COMPONENT

Technical Field

This invention relates to prefabricated structural components adapted to be assembled to form various demountable building and other structures.

Background Art

Toy construction kits are known wherein a plurality of identical components are provided adapted to be assembled together in a variety of ways to form models of a great variety of different articles and structures. Usually the individual components are adapted to be held together by inter-engaging formations providing some frictional restraint on disengagement. Alternatively specific coupling pieces adapted to be similarly engaged with two or more basic components may be provided. In some instances the structural integrity of the finished model depends upon the simultaneous inter-engagement of more than two components.

The present invention is not concerned with the assembly of model structures but rather with the assembly of full scale, load bearing, skeletal frameworks of buildings and engineering structures generally.

Therefore, possibly more relevant prior art is the well-known demountable scaffolding used for temporary ancillary structures at building construction sites. Such scaffolding comprises a multiplicity of basic tubular members and many and varied coupling elements for fastening the basic members together. Typically the coupling elements comprise clamps, pins extending through clearance holes in the members and temporarily held in place by cross-cotter pins, U-shaped straps on the members adapted to be aligned to receive wedges and other quick release, fastening devices. The coupling

elements and the adaptations of the basic members of such scaffolding to their associated coupling elements frequently displays considerable ingenuity providing for the rapid assembly and disassembly of the scaffolding without the need for tools or anything but the most basic of tools, such as a hammer.

Summary of Invention

The emphasis in prior known scaffolding is on the quick assembly and disassembly of individually lightweight members able to be manhandled into position. Thus, strength in the finished scaffolding is ensured by using a considerable number of closely spaced members. This renders conventional scaffolding components unsuitable for use in demountable structures that substantially replicate the load bearing, skeletal structures of finished buildings and the like.

An object of the present invention is to provide multi-purpose, de-mountable and re-useable structural components that may be used in the construction of temporary buildings or other structures at construction sites adapted for habitation or normal use by building workers and others during the construction of permanent structures at the site in question.

Typically the components of the invention may be used as columns and/or beams in demountable structures such as: protective pedestrian walkways adjacent to construction sites; site offices, possibly integrated with such walkways; multi-storey towers providing access and service facilities to the various floors of a multi-storey building under construction; garages; storage sheds; barracks; and like temporary building ancillaries required at civil engineering construction sites.

According to one aspect, the invention consists in a fabricated structural component having five substantially planar faces corresponding to five faces of

a an elongated rectangular prism, namely an elongated side face, including two longitudinally extending edge margins, two elongated edge faces, and two end faces;

wherein each said side face is pierced by a plurality of fastener clearance holes arranged in two straight rows, each extending longitudinally of a respective one of said margins, wherein the holes in each row in said side face have a constant centre to centre pitch distance, wherein the distance from the centre of each end hole in each row of holes in said side face to a respectively adjacent end face of the component is substantially one half of said pitch distance, wherein the distance from the centre line of each row of holes in said side face to a respectively adjacent edge face of the component is substantially one half of said pitch distance, and wherein the centre lines of the rows of holes in said side face are separated by a distance substantially equal to a whole number multiple of said pitch distance;

wherein each said edge face is pierced by a plurality of fastener clearance holes arranged in a straight row extending longitudinally of said each edge face, wherein the centre to centre distance between the holes in the row in said each edge face equals said pitch distance, wherein the distance from the centre of each end hole in the row of holes in said each edge face to a respectively adjacent end face of the component is substantially one half of said pitch distance, and wherein the distance from the centre line of the row of holes in said each edge face to the side face of the component is substantially one half of said pitch distance; and

wherein each end face is pierced by at least two fastener clearance holes, wherein the distance from the centre of each of said at least two holes in each end face to said side face is substantially one half of said pitch distance and wherein the distance from the centre of each of said at least two holes in each end face to a respectively adjacent edge face is substantially one half of said pitch distance.

According to a second aspect of the invention, it consists in a fabricated structural component, having six substantially planar faces corresponding to the sides of an elongated rectangular prism, comprising two components, each according to the first aspect of the invention, united by a plurality of discrete, spaced apart spacer means, such that corresponding edge faces of the two components according to the first aspect are spaced apart and co-planar, and wherein the spacer means are such that the distance between the centre lines of the rows of holes in each pair of corresponding edge faces is a whole number multiple of said pitch distance.

It is pointed out that the whole number referred to in the above description of structural components according to the second aspect of the invention may or may not have the same value as the whole number referred to in the description of structural components according to the first aspect of the invention.

In preferred embodiments of the first aspect of the invention the component is fabricated from two, angle sectioned elements, each comprising two flanges meeting at substantially a ninety degree included angle, for example lengths of rolled structural steel angle, spaced apart and rigidly held together by discrete and spaced apart spacer plates extending between and welded to co-planar flanges of the two elements. Thus two parallel, spaced apart, co-planar flanges of the two elements constitute the margins of said side face, and the other flanges of the two elements respectively constitute the said edge faces. Of course, this spaced apart angle construction carries through to preferred embodiments of the second aspect of the invention. This is an important feature of the preferred embodiments as it provides hand access to the interior of components according to the second aspect of the invention, and facilitates such access to the side of a component according to the first aspect remote from an assembler of the components when putting together a structure made of components according to the invention. Such access is convenient, when

assembling the components using removable fasteners in the form of bolts and nuts, to enable both the head of each bolt and a nut threaded on it to be simultaneously engaged by appropriate spanners.

By way of example two embodiments of the above-described invention are described in more detail hereinafter with reference to the accompanying drawings.

Brief description of the Drawings

Figure 1 is a perspective view of an end portion of a structural component according to the first aspect of the invention.

Figure 2 is a front elevation of the component of figure 1, drawn to a smaller scale.

Figure 3 is both a plan view and an inverted plan view of the component of figure 2, in that the component is identical in appearance when viewed from above or below.

Figure 4 is an end elevation of the component of figure 2.

Figure 5 is a sectional view taken on line 5-5 of figure 2, drawn to a larger scale.

Figure 6 is a view similar to figure 1 of a component according to the second aspect of the invention.

Figure 7 is both a front and a rear elevation of the component of figure 6, in that the component is identical in appearance when viewed from the front and the rear, drawn to a smaller scale.

Figure 8 is an end elevation of the component of figure 7.

Figure 9 is a sectional view taken on line 9-9 of figure 7.

Best Mode of putting the invention into effect.

The multi-purpose structural component illustrated by figures 1 to 5 inclusive comprises two identical, elongated angle sectioned elements 10, each comprising side flanges 11 and edge flanges 12 (see figure 5), and a plurality of discrete and spaced apart spacer plates 13 and 14 extending between and welded to co-planar flanges 11 of the two angle sectioned elements. Thus, the two angle sectioned elements 10 are held rigidly together in a parallel, spaced apart configuration. The two, co-planar flanges 11 together constitute longitudinally extending margins of the side face of the structural component (and for that reason have been captioned side flanges herein), whereas each of the flanges 12 constitutes an edge face of the component, (and for that reason have been captioned edge flanges herein).

The two angle sectioned elements 10 are further held and rigidified by end spacer plates 16, constituting the end faces of the component now being described.

Each of the side flanges 11 and each of the edge flanges 12 is pierced by a straight row of fastener clearance holes 15 extending longitudinally of the respective flanges. In accordance with the invention, and as indicated in figures 2, 3 and 5, the holes 15 in each row are spaced apart by a common, centre to centre, pitch distance "p", the distance from the centres of the end holes in each row to their respectively adjacent ends of the component is "p/2", the distance from the centre line of the row of holes in each edge flange 12 to the side face of the component is "p/2", and the distance from the centre line of

each row of holes in the side flanges 11 to their respectively adjacent edge face is also "p/2". Moreover the spacer plates 13, 14 and 16 are such that the distance between the centre lines of the rows of holes in the side flanges 11 is "np", where "n" is a whole plural number. In the illustrated embodiment "n" is 2, but in other embodiments it may be 1 or a number larger than 2.

Furthermore, each end spacer plate 16 is pierced by two fastener clearance holes 15, and, as may best be seen in figure 5, the centres of those two holes are spaced from the side face and from their respectively adjacent edge faces by "p/2".

In other examples of the invention, the end spacer plate may be pierced by one or more further holes disposed in a row of which the two illustrated holes are end holes of the row. In such instances all holes in the row would be equally spaced apart, so as to have a centre to centre pitch distance of "p".

Furthermore some or all of the spacer plates 14 may be replaced by angle sectioned spacers or T-sectioned spacers, wherein one flange of the angle or the head of the T corresponds to the plate 14, provided the other flange of the angle or the stem of the T is appropriately spaced from the immediately adjacent holes 15.

It will be apparent to a man skilled in the art that the structural component illustrated by figures 1 to 5 would display considerable versatility as an element of many and varied, complex, demountable structures. Two such components may be bolted together in end to end or face to face abutment with various degrees of overlap, or may be bolted together at Tee or Cross joints at a great number of positions, merely by appropriately aligning selected fastener holes for the receipt of bolts or other fasteners.

The structural component illustrated by figures 6 to 9 inclusive may be described as a dual component. It comprises two single components, each according to figures 1-5 inclusive, which require no further description, with each single component's corresponding edge flanges 12 held in a parallel, spaced apart configuration by spacer plates 17 in register with the single components' spacer plates 14, and spacer plates 18 in register with the single components' spacer plates 13. Furthermore the end spacer plates 16 of the two single components are preferably integrally merged as margins of an end spacer plate 20 in the dual component.

Also internal cross-braces 19 may be provided in register with one or more of the pairs of spacer plates 17, to further rigidify the dual component.

The spacer plates 17 and 18 and the end spacer plate 20 are such that the centre lines of the rows of holes in the corresponding flanges 12 of the single components are spaced by a whole number multiple of the pitch distance "p", which may or may not be the same whole number multiple applicable to the distance between the rows of holes in the side flanges 11 of the single components.